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Lake Okeechobee
Managed Recession
After Action Report
and
Priority Action Plan

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November 3, 2000

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Executive Summary

November 3, 2000

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Executive Summary

In April 2000, the Governing Board of the South Florida Water Management District (District, SFWMD) faced one of the most difficult water resource management decisions in the agency's recent history. Persistent high water levels due to a series of wet rainfall years were severely threatening the ecological health of Lake Okeechobee. However, attempting to manage a significant recession of Lake Okeechobee water levels late in the 2000 dry season could result in impacts to the downstream estuaries, the Everglades habitat, as well as the back-up water supply for agricultural industries and 6 million residents in urban South Florida. In an effort to balance these risks and based in part on favorable long-term climate forecasts, the SFWMD Governing Board approved the Shared Adversity Plan in April 2000, with the goal of lowering Lake Okeechobee from 14.89 to 13 feet National Geodetic Vertical Datum (NGVD), and holding it at 13 feet NGVD for eight weeks to promote the reestablishment of submerged aquatic vegetation to reestablish.

1. Was the intended goal accomplished?

This plan was a hydrological and environmental success for Lake Okeechobee, as the lake level dropped to below 13 feet NGVD by May 21, and the submerged aquatic vegetation community has responded well in most areas of the lake. Prolonged dry conditions during the remainder of the summer resulted in the lake level remaining near or below 12 feet NGVD through September, which further enhanced submerged aquatic vegetation recovery. In addition, the downstream ecosystems, such as the St. Lucie Estuary and the Caloosahatchee Estuary, are recovering from the short-term impacts that were experienced.

2. What worked well and what did not?

The environmental responses generally followed scientific expectations. In Lake Okeechobee, submerged plants rebounded, water clarity improved, and phosphorus concentrations declined. As of October 2000, there were over 43,000 acres of submerged aquatic vegetation in the lake. In addition, several thousand acres of marsh were treated and burned for torpedograss control and over 8,000 native trees were planted. Negative impacts to the estuaries and Everglades appear to be of relatively short duration and severe impacts were isolated. Although concerns were expressed by the public that the adversity was not truly shared by all systems and interests, the affected interest groups were willing to cooperate and accept some adversity to help Lake Okeechobee.

As anticipated, lower water levels in Lake Okeechobee increased the spread of the exotic plants, primarily torpedograss and melaleuca. In addition, the discharges reduced salinity and increased turbidity in the estuaries. Nutrients associated with discharges likely contributed to an algal bloom in the Caloosahatchee estuary. Operationally, releases from Lake Okeechobee to the Everglades were constrained by conveyance capacity, causing the St. Lucie and Caloosahatchee estuaries to receive the majority of discharge. In addition, serious risks emerged with respect to water supply. The climate predictions for the wet season proved to be inaccurate, and the region faced a much drier than expected wet season. The risk of water shortage increased dramatically from less than 30 percent when originally forecast in April to 90 percent by mid-September, requiring the development of a water supply contingency plan. By September, the Governing Board approved an emergency action plan proposed by staff to lessen the risk of water shortage.

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3. What could have been done better?

It is recognized that, ideally, a plan for a recession of this magnitude for Lake Okeechobee should have been developed sooner and implemented with greater knowledge of potential benefits and impacts. A fully engaged public process with representation of all stakeholders, well in advance of the actual recession, could have prevented some of the misperceptions as to the emergency nature of this action. Beginning the public process earlier would have potentially resulted in a longer implementation period (i.e., started earlier in the dry season). This would have reduced estuarine impacts by discharging smaller volumes over a longer time period, provided staff and the public with much needed documentation regarding the urgency and potential impacts of the recession, and optimized the success of the action.

At the time that the Shared Adversity Plan was implemented, no accepted operational protocol had yet been developed to provide early operational guidance to reduce adverse conditions in the lake or the estuaries. Development of operational protocols has been initiated as a result of the approval of the *Lower East Coast Regional Water Supply Plan* (LEC Plan) (SFWMD, 2000a) in May 2000, and the implementation of the Water Supply and Environmental (WSE) regulation schedule for Lake Okeechobee in July 2000. SFWMD staff is developing these operational protocols that will provide for environmentally beneficial operations when conditions allow within the WSE schedule.

4. What existing programs are already planned and approved to improve the management of Lake Okeechobee and minimize impacts to other components of the South Florida system?

A series of programs are being implemented that substantially reduce the environmental problems that led to the managed recession and the water shortage risks that resulted following the Shared Adversity Plan. These actions were approved by the Governing Board as part of specific planning efforts, including the Comprehensive Everglades Restoration Plan (CERP), the LEC Plan, the *Lower West Coast Water Supply Plan* (SFWMD, 2000b), the Everglades Construction Project, and the *Caloosahatchee Water Management Plan* (SFWMD, 2000c).

The implementation time frames of these approved programs can be classified as near-term (less than 5 years for completion), mid-term (completed within 5 to 10 years), and long-term (completed after 10 years). Some of the near-term approved actions include the following:

1. Evaluation of systemwide operational protocols based on assumptions in the LEC Plan
2. Implementation of a water supply contingency plan
3. Modified water deliveries to Everglades National Park/C-111 Projects
4. Completion of STA-3/4 for additional water treatment south of the lake
5. Diversion of flows from Chapter 298 Drainage Districts south to STAs instead of the lake
6. Implementation of Minimum Flows and Levels (MFLs) criteria for Lake Okeechobee, and the Caloosahatchee and St. Lucie estuaries

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7. Implementation of rain-driven operations for most of the Everglades systems

Some of the mid-term approved actions include construction of reservoirs in the Everglades Agricultural Area (EAA), and construction of the C-44 Basin Storage Reservoir. Some of the long-term approved actions include construction of the CERP projects in the watershed north of Lake Okeechobee, and construction of Aquifer Storage and Recovery (ASR) facilities in the C-43 Basin.

5. What specific priority actions will be proposed to provide short-term relief for the Lake Okeechobee ecosystem and the St. Lucie and Caloosahatchee estuaries, while protecting the water supply needs of the region?

The District recommends the implementation of the proposed Priority Action Plan, which is a six-point plan to immediately improve the health of Lake Okeechobee's littoral zone, reduce damaging discharges to the estuaries, and increase the certainty of water supply, without impacting existing levels of flood protection. The six steps are as follows:

1. Immediately install new pumps on Lake Okeechobee to significantly increase water supply deliveries at low lake stages and identify discretionary operational protocols to maximize operational flexibility
2. Step up the aggressive implementation of an exotic eradication plan for the Lake Okeechobee littoral zone
3. Investigate and immediately implement feasible alternatives providing additional lake diversion for estuarine protection
4. Investigate and, where feasible, immediately accelerate design and construction of five storage and treatment projects
5. Develop specific District policy guidance that implementation of the Modified Water Deliveries Plan for Everglades National Park is in the agency's highest interest
6. Develop a comprehensive legislative and congressional initiative for increased funding to implement priority action items and begin a comprehensive constituency outreach

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Lake Okeechobee Managed Recession
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After Action Assessment Technical Analysis

November 3, 2000

After Action Assessment Technical Analysis

The purpose of this report is to assess the following questions relative to the Lake Okeechobee “Shared Adversity” Managed Recession conducted between April 25, 2000, and September 2000:

1. Was the intended goal accomplished?
2. What worked well and what did not?
3. What could have been done better?
4. What existing programs are already planned and approved to improve the management of Lake Okeechobee and other components of the ecosystem?
5. What specific short-term priority actions will be proposed to provide immediate relief to the Lake Okeechobee ecosystem and the St. Lucie and Caloosahatchee estuaries, while protecting the water supply needs of the region?

Background

Lake Okeechobee is located at the center of the Kissimmee-Okeechobee-Everglades ecosystem. Given its central location and the interconnected land and hydroscape of South Florida, hydrological events affecting Lake Okeechobee also influence the ecosystems downstream, such as the Everglades and the St. Lucie and Caloosahatchee estuaries. The lake is designated as a Class I water body (potable water supply), and serves multiple purposes in the region:

- In-lake habitat for fish, migratory waterfowl, wading birds, and several federally protected species
- A critical source of water for the farms and communities around the lake
- A backup source of water for coastal canal recharge in much of the urbanized coastal areas of Palm Beach, Broward, and Miami-Dade counties
- Irrigation water for coastal agricultural lands
- Fresh water for the Everglades and the estuaries
- Flood protection
- Navigation
- Recreational activities

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The District's responsibility, and challenge, is to manage Lake Okeechobee to balance these often competing purposes. Hence, it is critical that Lake Okeechobee be managed in a holistic fashion because improved management of this resource can have benefits for the lake and the entire system.

Lake Okeechobee currently faces three major environmental problems: 1) excessive phosphorus loads; 2) rapid spread of nuisance and exotic species, especially in the littoral marsh; and 3) unnaturally high and low water levels because the lake is managed for multiple purposes including water supply and flood control. Indeed, one of the most challenging management issues continues to be striking a balance between the growing demands for water supply and flood control, and the need to protect the health of the lake and the downstream ecosystems.

This report focuses primarily on the problem of high water levels. However, the impact of water level does not operate in isolation; all three environmental problems interact with each other, and can compound and complicate efforts to maintain a healthy ecosystem while simultaneously meeting the lake's water supply and flood control functions. Over the past ten years, lake levels have remained extremely high ([Figure 1](#)), rarely falling below a lake stage of 13 feet (NGVD). Reasons for the high lake stages include unusually high precipitation over several years in addition to a lake regulation schedule (Run 25) that kept the lake relatively high. This regulation schedule varied the lake stage between 15.65 feet NGVD at its lowest point (i.e., any stage above this point on May 31 triggered flood control releases from the lake; the severity of the release depended on how high the stage was) and 16.75 feet NGVD at its highest point (i.e., any stage above this point on September 30 triggered flood control releases). The purpose of the 15.65 to 16.75 feet NGVD schedule was to reduce freshwater discharges to the St. Lucie and Caloosahatchee estuaries without sacrificing the flood control or water supply benefits derived from the lake (SFWMD, 1997). However, high lake stages still occurred in very wet years, resulting in discharges to the estuaries. In addition, the high lake stages had damaging impacts on the ecology of Lake Okeechobee.

High water levels had the following negative ecological impacts on Lake Okeechobee:

- Less light reached the bottom of the lake, resulting in loss of submerged vegetation (shrimp grass, peppergrass, and eelgrass)
- Increased wave action, which uprooted bulrush beds
- Internal waves within the lake's water column spread the loose sediments from the center of the lake to the nearshore region, resulting in more turbid, nutrient-rich water reaching this sensitive area
- Fish surveys showed that juvenile fish classes were being dramatically reduced in the lake, presumably because of the loss of submerged plant habitat

A new regulation schedule, Water Supply and Environmental (WSE), was developed that would provide a greater balance between water supply and environmental needs of the lake. The WSE schedule lowers the lake stage on average and also uses local hydrologic conditions, recent weather patterns, and long-range climate forecasting to anticipate El Niño (wet cycles) and La Niña (dry cycles) events. Although this schedule is not a panacea for lake level problems, it is a

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step in the right direction. After 6 years of analysis, which included environmental and water supply considerations, the federal agencies approved the WSE schedule in July 2000.

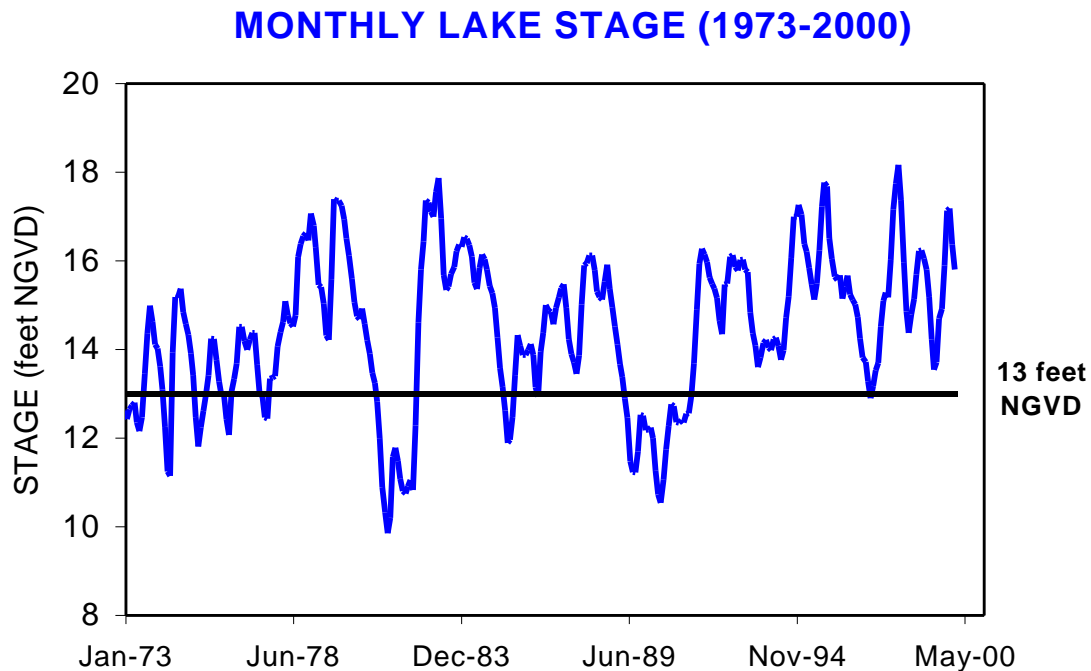


Figure 1. Mean monthly lake stage of Lake Okeechobee from 1973 through 2000. Note the relatively few occurrences when lake stage dropped below 13 feet NGVD since 1990.

Conditions That Led to the Shared Adversity Plan

Seven (7) of the past nine (9) years exhibited above average rainfall over Lake Okeechobee and its tributary drainage basin. The resulting successive years of high lake levels nearly eliminated the lake's submerged aquatic vegetation community, damaged nearshore emergent plants, resulted in turbid, nutrient-rich water, threatened the survival of a multimillion dollar sport fishery, and caused several high level discharge events to the St. Lucie and Caloosahatchee estuaries. Scientists, resource managers, and concerned members of the public reached a strong consensus that unless a sustained period of low lake stages were to occur, many of the ecological and societal values of the lake resource might be lost. In 1999, the lake levels fell to 13.5 feet NGVD which resulted in some submerged aquatic vegetation recovery although it was not widespread. Consultation with an expert on Florida submerged plants at the U.S. Army Corps of Engineers' Waterways Experiment Station indicated that a period of at least 8 weeks of low water levels was needed for plant germination and growth. This opinion, combined with the best professional judgement of scientists at the SFWMD and Florida Fish and Wildlife Conservation Commission (FWC), resulted in the recommendation by District scientists that if lake stage could be lowered to 13 feet NGVD or lower, for at least 8 weeks, conditions would be

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favorable for reestablishing a healthy submerged aquatic vegetation community in Lake Okeechobee.

The Shared Adversity Plan

In April 2000, the Governing Board of the South Florida Water Management District faced one of the most difficult water resource management decisions in the agency's recent history. Attempting to "manage" a significant recession of Lake Okeechobee water levels late in the 2000 dry season could result in impacts to the health of the downstream estuaries, the Everglades habitat, as well as the water supply for agri-business and the 6 million residents in urban South Florida.

Additionally,, several important water resource elements appeared to be aligned, which might provide the District with a unique opportunity to successfully manage a beneficial spring recession in Lake Okeechobee:

- Low rainfall in the preceding two months reduced the probability of high runoff in the subsequent weeks if rainfall were to occur. This increased the chances that a prolonged period of low stages could be maintained.
- Lower than average rainfall for the remainder of the 2000 dry season was a higher probability because of the La Niña conditions that existed. Dry conditions would reduce inflows and make it possible to maintain lower lake stages for the 8 week minimum duration, with less impact to the estuaries and the Everglades.
- Over the historic period of record, no La Niña event had ever persisted for three consecutive years. Since 2000 was the second consecutive La Niña year, it could reasonably be assumed that the probability of third dry season with significantly below average rainfall in early 2001 was relatively low. This was considered as additional supporting information that the risk of water shortages may be lower than it might be if another La Niña year would occur.
- The Climate Prediction Center of the National Oceanic and Atmospheric Administration was consistently indicating a higher than normal probability of above average rainfall in the late wet season of 2000. If these predictions were correct, this would provide the much needed water supply volume at a time that would nominally impact the new vegetation in the littoral zone, but would be available for use in the early dry season months.

The latest version of the South Florida Water Management Model was used to evaluate potential impacts associated with alternative operational strategies. The model simulations were performed in position analysis mode. In this mode, the model is initialized with the existing hydrologic conditions. Then, 30 different simulations were performed using the rainfall conditions that occurred in the 30-year period of record between 1965 and 1995. In this way, it was possible to estimate the probability of potential outcomes for each proposed alternative. Sets of hydrologic performance measures were developed to help evaluate the relative impacts on the lake ecology, water supply, the Everglades, and the estuaries.

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In April, 2000, the District held a series of public meetings and a public workshop with all affected parties. This outreach effort resulted in the development of three potential management alternatives. On April 25, the Governing Board of the South Florida Water Management adopted the most aggressive of three proposed alternatives to remove water from the lake, known as the “Shared Adversity Plan”. The Plan was known under this name because of the recognition that it held the most potential to meet the desired ecological outcome for Lake Okeechobee, but that it brought with it the risk of potentially damaging effects to the estuaries, the Everglades, and water users surrounding and depending on the lake.

The plan was immediately implemented. Discharges to the east, west, and south continued for 27 days, at which point releases from the lake were terminated on May 21, 2000. On that date, the lake level had fallen from an average elevation of 14.89 feet NGVD to an average elevation of 13 feet NGVD. Approximately one foot of this decline has been attributed to the recession management activities. The remainder was due to evapotranspiration and water supply deliveries.

The operational guidelines for the Shared Adversity Plan called for releases from the lake throughout every major outlet structure ([Figure 2](#)). Maximum practicable releases were sent to the St. Lucie and Caloosahatchee estuaries. Lake Okeechobee recession releases were also sent to the Water Conservation Areas (WCAs), under a variety of conditions. Every effort was made to maintain as much water in the system as possible rather than losing potential water supply to tide, although hydrologic conditions in the WCAs greatly limited this effort.

Inflows into the WCAs were constrained to equal outflows into the downstream service areas, as long as the WCAs were above the corresponding flood control schedules. For WCA-1 (Arthur R. Marshall Loxahatchee National Wildlife Refuge) and WCA-2A, inflows were not constrained by outflows as long as stages in these WCAs were below the regulation schedules. Releases from the lake into the Miami Canal were constrained to the volumes WCA-3 could pass to the Miami-Dade area, as long as stages in WCA-3 were below regulation schedule. Water supply inflows into the WCAs were pumped to maximize effectiveness of the deliveries. Water was pumped from Lake Okeechobee into the Holey Land Wildlife Management Area up to approximately a 2-foot depth. Operational guidelines were modified so that more of the Lower East Coast (LEC) water supply was provided from the lake rather than the WCAs. Also, LEC canal stages were raised without impacting flood control so that a small amount of additional water was effectively stored in the Biscayne aquifer. All the operational guidelines in the Shared Adversity Plan were implemented consistent with the 2000 Emergency Actions to Protect the Cape Sable Seaside Sparrow Interim Structural Plan.

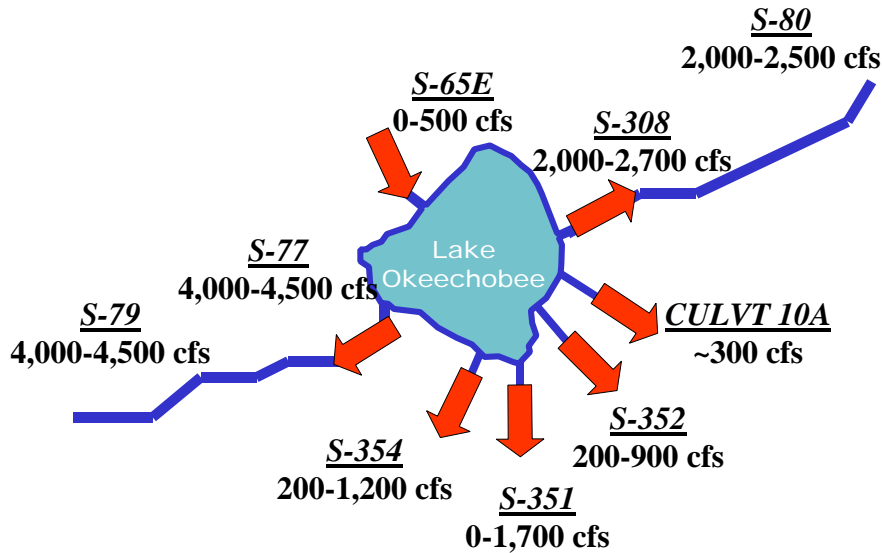


Figure 2. Typical discharge ranges that occurred during the peak discharge period of the managed recession (April 25, 2000, through May 21, 2000)

Lake Okeechobee

The hydrologic goal of the Shared Adversity Plan to lower the water level in the lake to 13 feet NGVD was accomplished on May 21, 2000. The additional goal of maintaining water level at or below 13 feet NGVD for 8 weeks has been exceeded in both stage and duration due to drought conditions.

1. What worked well

Ecological Responses

A prolonged period of low water levels --extended well beyond the managed recession due to drought conditions -- was effective in promoting the growth of submerged plant beds, providing habitat for fish, and improving water quality in terms of increased clarity and reduced concentrations of phosphorus. Also, low water conditions were favorable for programs to control torpedograss.

During mid-June, after an initial period of no response, scientists began to observe water clarity improvements, starting at the southern end of the lake and then progressing in a clockwise direction around the lakeshore. Plants began to grow and expand quickly when water clarity increased. Initially, the response was dominated by *Chara* (shrimpglass), which formed dense

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lawns on the bottom of protected bays. These lawns stabilized the lake sediment and led to further improvements in water clarity. By early August the *Chara* extended for miles offshore in both the southern and western regions of the lake. Young *Vallisneria* (eelgrass) and *Potamogeton* (peppergrass) then began to appear.

As of the end of September, the southern and western regions of the lake had dense growth of *Chara*, and widespread but sparse growth of eelgrass, peppergrass, and *Hydrilla* in. The north region remained quite turbid due to mud sediments through the summer months. By late September, the north region also developed clear water conditions and now supports widespread sparse growth of young eelgrass plants. In September, plants were observed at 23 of the District's 42 long-term submerged plant monitoring stations in the lake, as compared to just two sites in April and 10 sites in August of 1999. An extensive survey of the lake in October 2000 (over 1,600 sites) found that the total area of submerged aquatic vegetation was in excess of 43,000 acres. This area was largely dominated by *Chara*, but also included 10,600 acres of eelgrass, 6,500 acres of hydrilla, and 2,500 acres of peppergrass. District scientists also have observed hundreds of active fish beds along the western lakeshore, and large flocks of wading birds including ibis, spoonbill, egret, heron, and wood stork in the littoral zone.

Exotic Plant Control

The recession operation also provided an opportunity to carry out controlled fires and herbicide treatment in the littoral zone to control torpedograss ([Figure 3](#)). Low water levels in the lake enabled a prescribed fire to burn nearly 800 acres in the northern portion of the littoral zone. A wildfire burned another 650 acres of torpedograss in the northern portion of the littoral zone. The continued low water levels allowed approximately 1,000 acres of torpedograss in these burned areas to be treated with herbicide in late September. In addition, approximately 2,000 acres of torpedograss were treated with herbicide in an unburned area of the marsh near Buckhead Ridge, also in late September.

Tree Planting

Low water levels in the lake made it possible to plant more than 8,000 native trees near Moore Haven in July 2000. The trees were planted in portions of the littoral zone where control efforts greatly reduced or eliminated exotic plants. Trees were planted in an interagency effort that included the SFWMD, the Florida Department of Environmental Protection (FDEP), and the U.S. Army Corps of Engineers (USACE), as well as 275 District volunteers.

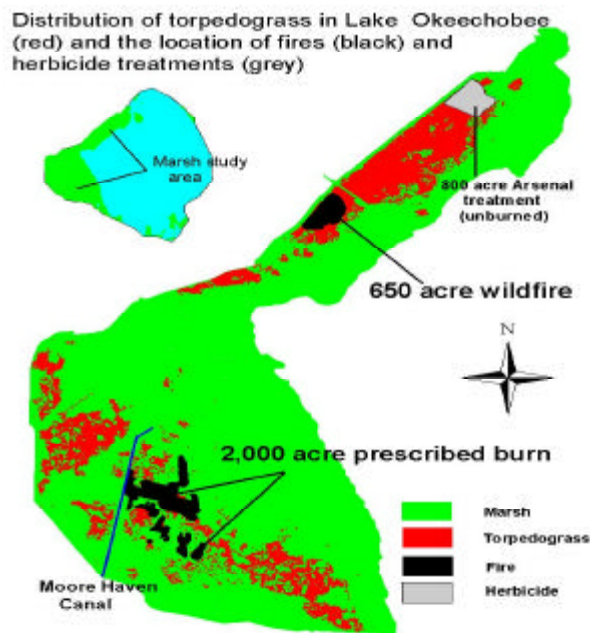


Figure 3. Distribution of torpedograss in Lake Okeechobee (red) and the location of fires (black) and herbicide treatment (grey).

2. What did not work well

Ecological Response

The low water levels may allow *Melaleuca* and torpedograss to expand into areas of the littoral zone where they presently do not occur. The risk of this expansion will increase as the duration of low lake stage increases. The submerged plant communities in the northern region of the lake did not respond as quickly or as strongly as anticipated to the lake recession, perhaps because of a high amount of fine mud sediment in that area.

Exotic Plant Control

Although the littoral zone of Lake Okeechobee contains native plants such as spikerush, beakrush, and bulrush that benefit from periodic drying, low water events also promote the expansion of exotic plants. Although certain critical areas of the littoral zone may not experience a high risk until a lower lake stage occurs (near 11 feet NGVD), other areas at elevations above 12 feet NGVD elevation may have experienced invasion by exotics during the summer of 2000. This situation is a "Catch 22" because low water levels also create conditions favorable for exotic control by fire and herbicide application. In the future, exotic plant management programs will need to be designed to account for this situation, and perhaps focus control efforts at the leading edge of torpedograss expansion into native plant habitat. Spot treatments also may be required where exotics appear inside areas dominated by native plants after this and future low lake stage events. High water levels over the past several years have resulted in the formation of an organic at the interface of the littoral marsh and open water regions of the lake. This berm is holding

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water back in certain places of the marsh, and may restrict the ability to burn for exotic plant control. If burning is to be a successful tool for exotic control, active management may be required to remove this berm to keep this portion of the marsh dry.

Water Operations

Although it was possible to discharge water from the lake at rates that were sufficient, in combination with climatic conditions, to lower lake levels as desired, operational constraints required that the majority of the discharges be made to the estuaries. As the lake level receded to a level approaching 13.5 feet NGVD, it became necessary to lower water level at the eastern end of the St. Lucie Canal in order to maintain maximum discharges. The reduced canal level caused navigation problems for marinas in the central and eastern portions of the canal and threatened agricultural water supply intakes.

Water Supply

Lake Okeechobee is the primary source of water for users located around its perimeter in what is generally known as the Lake Okeechobee Service Area (LOSA). Lake Okeechobee also provides backup water supply for the LEC urbanized area by recharging the Biscayne aquifer so that saltwater intrusion does not occur. The WCAs are the primary source of water for maintaining dry season water levels in the LEC canal system. If WCA levels are below their “floor elevations”, water supply for the LEC is shifted to Lake Okeechobee. Typically, this occurs late in the dry season (March through May). The standard management of low levels in Lake Okeechobee is described in the Lake Okeechobee Supply-Side Management document (Hall, 1991). According to that publication, water shortage cutbacks would be imposed during the dry season if water available in the lake plus net rainfall in the lake basin are insufficient to meet the LOSA future average demands for the remainder of the dry season. However, this year the supply-side management procedures are being modified to manage the existing drought conditions as described in the **Near-Term Actions** section at the end of this report.

Prior to the managed recession, the lake level was 14.89 feet NGVD. When these discharges were terminated on May 21, the lake level was 12.99 feet NGVD. It subsequently fell below 12 feet NGVD. The loss of storage directly attributable to managed recession has been estimated to be about one foot on the lake, which is equivalent to about 400,000 acre-feet. Evapotranspiration directly from the lake accounted for about a 1-foot drop

1. What worked well

Water supply interests were cooperative and indicated a willingness to accept a portion of the “shared adversity” that came with an increased risk of shortages. However, if an extreme shortage occurred, these interests expected the same level of resources to be applied to minimize effects and to offset the impacts. Water shortage risks have been continually modelled and updated since the recession operations began. This has been extremely beneficial for understanding how such risks evolved over the recession period and in informing stakeholders what they could expect during the upcoming dry season.

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2. What did not work well:

The managed recession of Lake Okeechobee and its associated decrease in water storage resulted in reduced water availability for water supply this dry season. Although the risks of water shortages were estimated and presented prior to approval of the Shared Adversity Plan, rainfall conditions have been much drier than predicted, resulting in a significantly greater risk than originally anticipated (Table 1).

Table 1: Probability of water supply restrictions for three alternative operating strategies presented at the April 25, 2000, Governing Board Workshop

Alternative Operating Plan	Probability of Water Supply Restrictions*	
	Year 2000	Year 2001
Base Condition	7%	7%
Public Input Plan	17%	10%
Shared Adversity Plan	23%	27%

*Estimated in April 2000

Although the Climate Prediction Center's prediction included a late start of the wet season, South Florida actually experienced a longer and drier period since the managed recession began. Florida experienced the driest May on record (of 106 years) in the year 2000. July had approximately normal rainfall, but the months of June and August were also dry. As a consequence, water levels in the lake did not recover through October. This unanticipated drier than predicted May through August period resulted in a significant increase in the upcoming dry season risks of water shortages for the LOSA and LEC urban communities. The risk of water shortage increased from about 30 percent in the April 2000 estimates to 90 percent at the end of August. The Governing Board concurred with and approved emergency actions in September 2000 in an effort to lessen the risk. These actions are further described in the **Near-Term Actions** section of this report.

Estuaries

The impacts of the Shared Adversity Plan on the St. Lucie Estuary were primarily caused by the release of freshwater from the lake. In the Caloosahatchee Estuary, the impacts associated with the recession were attributable to two sources: 1) large releases from the lake, and 2) a constant 300-cubic feet per second (cfs) discharge to maintain low salinity in the upper estuary subsequent to the recession. In addition, impacts were associated with high salinity in the estuary prior to the discharges.

1. What worked well

One of the main concerns of the Shared Adversity Plan was potential impact on the estuaries. However, research by SFWMD staff over the past five years on these estuaries has indicated that short-term releases, although clearly not desirable for the ecology of these systems,

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should not have long-term negative impacts. Monitoring of the estuaries during and following the managed recession has supported those findings, at least with respect to the releases made during this recession.

Once discharges to the St. Lucie Estuary ceased, turbidity subsided within 4 days and salinity returned to ranges tolerable to the oyster within a week. Impacts to seagrasses in the Indian River Lagoon were confined to the smaller, deeper living species, but these seagrasses were back to normal by the end of June. In the Caloosahatchee Estuary, conditions have now returned to normal, although the recovery was slower and did not begin immediately upon reductions in discharges, as discussed below. Seagrasses in the Caloosahatchee Estuary recovered by June 2000. No damage was observed to downstream clam beds.

2. What did not work well

Discharges to the St. Lucie Estuary flushed all salt water from the South Fork and raised turbidity in this area to at least four times the background level. Impacts were observed within 6 days after discharges to the estuary began. Field tests showed that oysters in the South Fork could not survive these conditions. Elsewhere, oysters in the North Fork, middle estuary, and Indian River Lagoon were unaffected.

The large releases to the Caloosahatchee River during the recession caused mortality of seagrasses in the lower estuary. A 300-cfs release was continued following the recession for the purpose of maintaining salinity regimes appropriate for growth of submerged plants in the upper estuary. However, under the conditions that existed at the time, the constant load of nutrients associated with this discharge also fueled an intense algal bloom in the Caloosahatchee Estuary. Hence, the discharge was stopped on June 2, 2000. The bloom lasted from May 5 to June 14, 2000. When the algae died, dissolved oxygen levels declined. Dissolved oxygen levels rebounded quickly after the bloom dissipated, although one station in the upper estuary remained anoxic until at least mid-July.

Everglades

Three primary factors were evaluated to determine the impacts on the Everglades: tree islands, wading birds, and phosphorus loads.

1. What worked well

During the period of discharges to the Everglades, the WCAs were provided water supply discharges. By limiting the lake discharges to the WCAs, canal levels were generally maintained at or below the adjacent marsh water levels. As a result, very little lake water reached the Everglades marshes. The implementation of the Shared Adversity Plan had no apparent impact on tree islands. Additionally, the wading bird nesting seasons this year turned out to be one of the most successful for the Everglades as a whole in several decades. This was because the recession took place late enough in the year that much of the nesting season was completed. An intensive, one-day sampling operation during the recession revealed that hydrologic measurements along the Miami Canal showed relatively little canal-to-marsh water exchange, as much of the marsh water levels were below land surface. The implementation of the Shared

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Adversity Plan resulted in no apparent water quality impacts as determined from frequent phosphorus sampling in the marshes and canals during the course of the recession.

2. What did not work well

Flows into or through the WCAs were limited to the volume of water flowing out of the WCAs to the coast when the WCAs were above their respective schedules. During the Shared Adversity Plan, a smaller volume of water was discharged to the Everglades relative to the estuaries because of conveyance limitations.

What Could Have Been Done Better?

It is recognized that, ideally, a plan for a recession of this magnitude for Lake Okeechobee should have been developed sooner and implemented with greater knowledge of potential benefits and impacts. A fully engaged public process with representation of all stakeholders, well in advance of the actual recession, could have prevented some of the misperceptions as to the emergency nature of this action. Additionally, related monitoring and contingency plans associated with a major recession should have been preidentified in advance, including an exotic plant control plan, a water quality and submerged aquatic vegetation monitoring plan tailored to the goals of the recession, and a water supply contingency plan. Beginning the public process earlier would have potentially resulted in a longer implementation period (i.e. started earlier in the dry season). This would have reduced estuarine impacts by discharging smaller volumes over a longer time period, provided staff and the public with much needed documentation regarding the urgency and potential impacts of the recession, and optimized the success of the action.

At the time that the Shared Adversity Plan was implemented, no accepted operational protocol had yet been developed to provide early warning and operational guidance to reduce adverse conditions in the lake or the estuaries. For example, earlier, low-level discharges might have reduced the need for larger, damaging discharges later. Furthermore, prior to implementation of the WSE Regulation Schedule in July 2000 and the LEC Plan recommendations for Lake Okeechobee in May 2000, very little operational flexibility existed to take advantage of such protocols (with Run 25). With the recent implementation of WSE, SFWMD staff is developing operational protocols that will provide for environmentally beneficial operations within the WSE Schedule when conditions allow.

A series of actions were already under way at the time of the recession to substantially reduce the environmental problems that led to the managed recession and the water shortage risks that resulted following the Shared Adversity Plan. The Governing Board approved these actions as part of specific planning efforts such as the CERP, the LEC Plan, and the Everglades Construction Project. These actions are described below.

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Existing programs already planned and approved to improve the management of Lake Okeechobee and other components of the ecosystem

A broad array of actions are under way or planned for the near, mid, and long-term that will address the problems and constraints that existed at the time the Shared Adversity Plan was developed and implemented. All operational and structural modifications to the Central and Southern Florida (C&SF) Project must be designed to balance environmental restoration and protection, flood control, and water supply. Significant public input will be utilized in the planning, design, and construction of each of these actions. This section identifies near-, mid-, and long-term actions and provides time lines for implementation.

Near-Term Actions

Projects in this category include those that are either currently under way or will be completed within the next 5 years.

Lake Okeechobee WSE Regulation Schedule. Implementation of this schedule began in July 2000, upon the final approval of the USACE. Based on the results of hydrologic modeling, utilization of the schedule will provide benefits to Lake Okeechobee's littoral zone and marsh by reducing the frequency of prolonged periods of high water. Modeling also showed that implementation of the WSE schedule reduce the need for large, damaging discharges to the St. Lucie Estuary and will have no significant adverse impact on water supply from the lake.

Lake Okeechobee Discretionary Release Operational Protocols. Implementation of WSE provides an increase in operational flexibility to make environmentally beneficial discharges under certain conditions. SFWMD staff is in the process of developing operational protocols that will guide operations that provide discharges from the lake to the estuaries for the purpose of maintaining desirable salinity regimes. Additionally, the flexibility may be used under some conditions to initiate earlier discharges from the lake to reduce the probability of large, damaging releases later. The operational protocols are scheduled to be presented to the Governing Board in December 2000.

Systemwide Operational Protocols. District staff is reevaluating systemwide structure operations within the context of the proposed operational assumptions recommended by the LEC Plan. These systemwide operations will also need to be modified from time to time to take into account the construction of new water resource development projects, the implementation of rain-driven delivery schedules for the Everglades, and implementation of new MFLs. This reevaluation should incorporate the flexibility to facilitate short-term operational deviations to address extreme meteorological events or unanticipated negative ecological responses. This reevaluation should also incorporate the use of a wide range of environmental, water supply (e.g., reservoirs, ASR), flood control, and water quality performance measures that can be used to make real time system operational decisions. Furthermore, the implementation of these new criteria should be accompanied with the development of statistical risk assessment procedures and other real time decision support tools.

Water Supply Contingency Plan. Extremely dry conditions during, and subsequent to, the Lake Okeechobee recession have resulted in low water levels and reduced water supply storage late in the 2000 wet season. Consequently, there is a concern that water supply problems

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will be experienced in the 2001 dry season. In response, District staff, with substantial public input, developed a Water Supply Contingency Plan. The purpose of the plan is to ensure that the agency is prepared in case continued dry conditions result in water shortages. A set of options to manage water supply has been developed. These options are divided into three groups: 1) those that are most effectively implemented immediately, 2) those that would be most effectively implemented during the remainder of the wet season, and 3) those that would be most effectively implemented in the upcoming dry season. Options are also categorized according to whether they would most appropriately be implemented during moderate, severe, and/or extreme water shortage conditions. A water shortage team has been organized and responsibility for implementing the various water supply options has been assigned to appropriate team members. Implementation procedures and potential funding sources are also documented in the Water Shortage Contingency Plan (<http://www.sfwmd.gov/org/ema/wscpindex.html>). This plan can also be used as a plan for drought management in the future.

September 2000, Governing Board Action. In response to information generated in the development of the Water Supply Contingency Plan, the Governing Board directed staff to immediately implement 8 action items of a 9-point plan. The Governing Board action included the following: 1) declared a water shortage warning calling for voluntary water use cutbacks for the LOSA and voluntary 10% reductions in water use for the Lower East Coast urban area, which includes most of Palm Beach, Broward, Miami-Dade, and Monroe counties; 2) ordered that no BMP makeup deliveries from Lake Okeechobee to the Everglades be made in the 2000-2001 dry season; and 3) approved more than \$3 million for the acquisition of contingency pumps to move water from the lake, testing of the potential impacts of backpumping into the lake, an aggressive invasive plant control program for Lake Okeechobee, and a public education program for water conservation measures.

Torpedograss Management Plan. Torpedograss is an invasive exotic plant that has displaced more than 16,000 acres of native plant habitat in Lake Okeechobee's marsh. A comprehensive torpedograss management plan is scheduled for completion in November 2000. Despite the fact that a control method with 100 percent success rate has not yet been identified, the District plans to move forward aggressively with a program to eradicate torpedograss from the lake. Treatments will initially use the best available methods (herbicide and fire), but will be modified if and when better methods are identified by ongoing research efforts. Additionally, the LEC Plan recommends establishment of a Lake Okeechobee Vegetation and Fire Management Team to work in cooperation with the existing South Florida Interagency Fire Management Council. The new team will develop a Lake Okeechobee Vegetation Management Plan designed to manage torpedograss and melaleuca expansion within the lake. The goal will be to provide increased opportunity for control of the invasive species in anticipation of dry periods.

Modified Water Deliveries to Everglades National Park (Modwaters)/C-111 Projects. These projects, that are being implemented by the USACE, are designed to improve the hydrology of WCA-3 and Everglades National Park. When complete, the projects will alleviate problems that contributed to WCA-3A being above its regulation schedule during the recession and the resulting limitations to inflows from the lake. A biological opinion issued by the U.S. Fish and Wildlife Service in 1999 requires that the Modwaters Project be completed by 2003 to avoid further jeopardy to the Cape Sable seaside sparrow. Further improvements in the distribution of flows to the southern Everglades will result from completion of Tamiami Trail modifications are scheduled for completion in 2006.

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STA-3/4. Additional storage and treatment will be provided for 256,000 acre-feet per year of water released from the lake. This will alleviate constraints on Lake Okeechobee discharges to the Everglades based on water quality. The project will also result in a reduction in phosphorus loads to the lake of approximately 20 metric tons per year by reducing backpumping from the EAA. It will be operational in 2003.

STA-1 East. This STA may provide some storage and treatment during certain times of the year. It will be operational in 2002.

Chapter 298 Drainage Districts Diversion. As part of the Everglades Construction Project, approximately 25,000 acre-feet per year (6 metric tons of phosphorus) will be diverted away from Lake Okeechobee. This load is currently discharged from four local drainage districts and a state-owned lease. These flows will be directed to the STAs for treatment. Approximately half of the flows and phosphorus loads will be diverted by mid-2001, and the remainder will be diverted by the end of 2003.

Water Conservation/Reuse. The LEC Plan recommended several options aimed at supplementing traditional sources of water supply and providing contingency options for the implementation of the LEC Plan and the CERP. These options include an aggressive water conservation program, indirect aquifer recharge using highly treated wastewater (reuse), and desalinization of seawater. Water conservation allows more efficient use of the volumes of water that are already available and reduces the need for additional amounts of water from Lake Okeechobee. The plan recommends the following: immediate development and implementation of a conservation project; conduct a series of pilot projects over the next three years in Miami-Dade, Broward, and Palm Beach counties to resolve regulatory hurdles and address other technical issues; use reverse osmosis for seawater desalinization; and complete further analysis in 2003 to determine if the colocation approach can result in significant cost reductions.

Lake Okeechobee Minimum Flows and Levels. The proposed MFL criteria for Lake Okeechobee, as recommended in the LEC Plan, is defined as follows: water levels in the lake that should not fall below 11 feet NGVD for more than 80 days duration, more often than once every six years. This definition provides a balance among the following four key functions of the lake: (a) protection of fish and wildlife habitat within the lake's littoral zone; (b) water supply and storage for the LEC planning area; (c) protection of the Biscayne aquifer against saltwater intrusion; and (d) navigation and recreational access to the lake during dry periods. Development of MFL Recovery and Prevention Plans for Lake Okeechobee, the Everglades, and the Biscayne aquifer is underway. These plans include major regional water storage features (i.e., reservoirs, aquifer storage and recovery) that will come on-line over the next 20 years.

Proposed Minimum Flows and Levels for the Caloosahatchee River and Estuary. The proposed MFL criteria for the Caloosahatchee River and Estuary is based on the relationship between freshwater flows delivered to the estuary through the S-79 structure, salinity levels within the upstream estuary, and protection of submerged aquatic vegetation (*Vallisneria americana*). These submerged plant communities represent important habitat for the majority of estuarine species present within the upstream estuary, especially from November through March.

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Mid-Term Actions

Projects in this category include those that are scheduled to be completed between 5 and 10 years from now.

EAA Storage Reservoir(s). The CERP includes 60,000 acres of storage reservoirs within the EAA, with a preliminary schedule for beginning operation in 2009. Depending on the operation of these facilities, significant storage of Lake Okeechobee releases could be possible. Analyses in the LEC Plan indicate that the water supply provided by these facilities can significantly reduce the demands of the EAA on the lake in addition to storing excess water from the lake.

Everglades Rain-Driven Operations. The LEC Plan recommended the implementation of rain-driven operations for most of the Everglades systems. As a result, new operational rules are being developed for the purpose of improving the timing and range of water depths in the WCAs and Everglades National Park to benefit fish and wildlife resources. The source for some of these flows to the Everglades will be Lake Okeechobee. Implementation of rain-driven flows to WCAs 2B, 3A, 3B, and Everglades National Park could be developed and implemented by 2005. Rain-driven operations for WCA-2A should be developed and implemented by 2010. It is recommended that WCA-1 (Arthur R. Marshall Loxahatchee National Wildlife Refuge) retain its current regulation schedule.

C-44 Basin Storage Reservoir. This component of CERP consists of an aboveground storage reservoir with providing approximately 400,000 acre-feet of storage. It will capture local runoff from the C-44 Basin and store it to provide local water supply, including environmental requirements. The project is scheduled to be operational in 2007.

Long-Term Actions

Projects in this category include those that are scheduled for completion more than 10 years from now.

CERP Projects in the Lake Okeechobee Watershed. CERP includes four projects in the Lake Okeechobee Watershed: Taylor Creek/Nubbin Slough Reservoir and Stormwater Treatment Area; North of Lake Okeechobee Storage Reservoir; Lake Okeechobee Watershed Water Quality Treatment Facilities; and Lake Okeechobee Tributary Sediment Dredging. These projects include a range of components that include reservoirs, Stormwater Treatment Areas (STAs), wetland restoration, and sediment removal. CERP also includes a series of ASR wells around the lake. The goals of the projects are to improve the quality of water entering the lake and to capture peak runoff from the watershed to reduce the frequency and duration of high water levels that damage the littoral zone and require damaging releases to the estuaries.

C-43 Basin Storage and Aquifer Storage and Recovery. This component of CERP consists of aboveground reservoirs with a total storage capacity of approximately 160,000 acre-feet and ASR wells with a capacity of approximately 220 million gallons per day. Excess runoff from the C-43 Basin and flood discharges from Lake Okeechobee will be pumped into the

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reservoir and injected into the ASR wellfield for multiseasonal storage. The water will be used for water supply, including environmental needs in the estuary. The project is scheduled to be implemented by 2012.

Summary

From both a hydrological and environmental perspective, the Shared Adversity Plan's managed recession can be considered a success for Lake Okeechobee. Lake levels were lowered within the targeted time frame, water quality conditions improved throughout and following the recession time period, and the submerged plants showed a dramatic recovery. However, as anticipated, lower water levels in Lake Okeechobee enhanced the spread of the exotic plants torpedograss and melaleuca. However, the discharges reduced salinity and increased turbidity in the estuaries. Negative impacts to the estuaries appeared to be of relatively short duration and severe impacts were isolated.

The climate predictions for the wet season proved to be incorrect, and the region faced a much drier than expected wet season. The risk of water shortage increased dramatically from less than 30 percent when originally forecast in April to 90 percent by mid-September, forcing the SFWMD to develop a Water Supply Contingency Plan in response to a serious risk of water shortage for the 2000/2001 dry season.

It is clear that regional water management protocols need to be improved in order to lessen these types of emergency situations in the future, especially during the interim period before the construction of new water storage facilities recommended in both the CERP and the LEC Plan. Rapid implementation of these projects, especially new water storage facilities, is crucial for successfully balancing the needs of water supply and environmental protection.

This after action report provides a list of approved near-term, mid-term, and long-term actions that the SFWMD, in cooperation with its state and federal partners, are embarking upon to avoid emergency operations in the future. Nonetheless, it must be remembered that no matter how sophisticated our water management system is, South Florida is a region of climatic extremes, and situations will occasionally develop that overwhelm our ability to respond. Our goal must be to minimize those situations; hopefully this document moves us further along in that process.

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Lake Okeechobee Managed Recession
After Action Report
and
Priority Action Plan

Priority Action Plan

November 3, 2000

Lake Okeechobee Priority Action Plan

Objective

Implement a six-point plan to immediately improve the health of Lake Okeechobee's littoral zone, reduce damaging discharges to the estuaries, and increase the certainty of water supply, without impacting existing levels of flood protection.

1. Immediately acquire and install new pumps on Lake Okeechobee to significantly increase water supply capacity at low lake stages and identify discretionary operational protocols to maximize operational flexibility
2. Step up the aggressive implementation of an exotic eradication plan for the Lake Okeechobee littoral zone
3. Investigate and immediately implement feasible alternatives providing additional lake diversion for estuarine protection
4. Investigate and, where feasible, immediately accelerate design and construction of five storage and treatment projects
5. Develop specific District policy guidance that implementation of the Modified Water Deliveries Plan for Everglades National Park is in the agency's highest interest
6. Develop a comprehensive legislative and congressional initiative for increased funding to implement priority action items and begin a comprehensive constituency outreach program

Discussion of the Six-Point Plan

1. Immediately acquire and install new pumps on Lake Okeechobee to significantly increase water supply capacity at low lake stages and identify discretionary operational protocols to maximize operational flexibility

The recent implementation of the Shared Adversity Plan coupled with extreme dry conditions has resulted in a high probability of water shortages for the 2000/2001 dry season. In order to provide greater water supply flexibility, the Governing Board has authorized installation of temporary pumps at the S-351, S-352, and S-354 gravity structures at the southern end of Lake Okeechobee. These pumps will have the a total capacity of 1,400 cfs and will meet a portion of water user demands in the EAA and LEC should lake levels fall to more restrictive gravity discharge levels.

The recently approved WSE regulation schedule for Lake Okeechobee will provide a more ecologically-based stage target for lake elevation. The WSE schedule was approved USACE and implemented in July 2000. In additional, staff is developing discretionary protocols

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to take advantage of potential flexibility within the authorized WSE schedule identifying opportunities for better management of the lake when levels are below the regulatory release zones and above the water shortage zones.

Lake Okeechobee's water budget is primarily influenced by direct rainfall and runoff from the Kissimmee Basin. Operational opportunities in the Upper Kissimmee Chain of Lakes should be explored to reduce inflows in the wet season and to provide additional base flows during times of drought. These potential operational changes could result in less estuarine discharge, lower net lake stages, reduced water quality impacts and additional water supply depending on the spatial extent of rainfall conditions.

- The full pumping capacity of 1,400 cfs is expected to be operational by February 2001 at a cost of approximately \$2.4 million.
- The discretionary opportunities will involve better management of the appropriate salinity ranges for the St. Lucie and Caloosahatchee estuaries along with additional discharge opportunities to the Everglades and are anticipated to be identified in December 2000.
- Investigate operational opportunities in the Chain of Lakes for multiple benefits of lower lake stages, reduced water quality loading, reduced estuarine impacts, and water supply. Operational proposal must be consistent with the objectives of the Kissimmee Restoration Program.

2. Step up the aggressive implementation of an exotic eradication plan for the Lake Okeechobee littoral zone

A concerted five-year control effort is necessary to establish primary control of torpedograss in Lake Okeechobee. A draft five-year control plan developed by the Water Resources Operations Division vegetation management staff includes the full control scheme and reviews the problems associated with this plant, its biology and impacts in South Florida. It is important to note that successfully reaching the goals of this plan in the next five years will not solve Lake Okeechobee's torpedograss problem. Such success will lead to a program of continuing maintenance that must follow.

Torpedograss (*Panicum repens*) has destroyed more than 16,000 acres of valuable wildlife habitat in Lake Okeechobee's 100,000-acre littoral zone, and it is continuing its rapid expansion. The population in Lake Okeechobee constitutes the largest occurrence of torpedograss in any of Florida's public waters. Recognizing the severity of this situation, the SFWMD will move forward aggressively with a program to control the spread of this plant. Best available technologies (fire and herbicide) will be used, recognizing that control using these existing methods may not be 100 percent effective. A rigorous research program to identify additional, and perhaps more effective, control methods will occur in parallel with the management program, so that new methods can be brought on-line immediately as they are identified. The five-year treatment program based on controlled burns and herbicides is estimated to cost \$3.8 million.

3. Investigate and immediately implement feasible alternatives providing additional lake diversion for estuarine protection

The Shared Adversity Plan provided clear evidence that additional operational flexibility is needed during times of excess discharge from Lake Okeechobee for the purposes of conserving water for human and environmental uses and reducing environmental impacts. While the lake was discharging significant volumes of water to the estuaries and the Everglades, several areas in the District, conditions such as the C-23, C-24, and C-25 water use basins, were in near drought. Additionally, some environmental areas, such as the North Fork of the Loxahatchee River, have historically not received the volumes of water needed for optimum ecological health. Investigating additional diversion routes during times of high discharge may lead to improved resource management through conservation of water supplies, reduced estuarine impacts and environmental enhancement.

The following projects should be investigated for their potential in providing additional operational diversion:

- C-44 Basin diversion to C-23, C-24, and C-25 canals (500 cfs)
- EAA diversion through the Industrial Canal to the L-1, L-2, and L-3 Canals, (cfs to be determined)
- L-8 Canal diversion to the M-Canal, the West Palm Beach Water Catchment Area, and the Loxahatchee River (400 cfs)
- North New River diversion to STA-3 and-4 to reduce potential for backpumping to Lake Okeechobee (cfs to be determined)

4. Investigate and, where feasible, immediately accelerate design and construction of five storage and treatment projects

The storage constraints of the regional system were once again highly evident during the Lake Okeechobee managed recession of 2000. Serious environmental impacts were occurring to the lake, as a result of multiple years of above average rainfall and an inadequate regulation schedule. A decision to lower the lake by one foot resulted in discharging approximately 400,000 acre-feet of water to estuarine and other downstream areas. The loss of this resource was directly related to a lack of additional storage elsewhere in the system and resulted in significant estuarine impacts and water supply concerns. Proposed CERP storage projects, which could have provided the ability to capture and hold the released water, are not scheduled for completion for a decade or more. This recommendation is to accelerate several of the CERP storage projects with the goal of providing at least 400,000 –acre-feet of additional storage and to provide significant load reductions to the lake from the Taylor Creek/Nubbin Slough drainage basin by 2005.

An additional concept that should be investigated includes classifying the upper Floridan aquifer under the southern EAA as a nondrinking water aquifer. This strategy would reduce the water quality treatment concerns and accelerate the permitting, testing, and construction of ASR technology for water supply storage and supply.

Five proposed CERP storage projects should be investigated for acceleration (**Table 2**). Existing and revised completion dates are provided along with projected costs and issues that

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need to be addressed. The acceleration of these CERP projects will require further analysis of available funding, streamlining project management plans, and, potentially redirecting additional staff.

Table 2. CERP storage projects that should be investigated for acceleration.

Project	Current Completion	Proposed Completion	Total Cost	Storage Provided (acre-feet)
EAA Storage Reservoir Phase 1	2009	2005	\$223,408,000	240,000+
C-43 Storage Reservoir(Part)	2009	2005	\$120,000,000	100,000+/-
C-44 Storage Reservoir	2007	2005	\$112,562,000	30,000
Taylor Creek/Nubbin Slough Storage Reservoir and STA	2009	2005	\$104,026,000	50,000
Southern EAA ASR Operation	-	2005	To be determined	To be determined

5. Develop specific District policy guidance that implementation of the Modified Water Deliveries Plan for Everglades National Park is in the agency's highest interest

The Modified Water Deliveries Plan is considered the keystone for the implementation of environmental restoration through the completion of major CERP projects to the north including WCA decompartmentalization. It is also important for better management of Lake Okeechobee because lower lake levels will require more discharge capacity to the south. The immediate implementation of the plan is critical to providing short- and long-term benefits to the environment, protection of the Cape Sable seaside sparrow habitat in Everglades National Park and estuarine protection.

- The Governing Board should provide policy guidance as to whether it is in the District's highest interest to facilitate all available political support in the Florida Legislature and U.S. Congress to meet the required implementation deadline of 2004 for this important initiative.

6. Develop a comprehensive legislative and congressional initiative for increased funding to implement priority action items and begin a comprehensive constituency outreach program

In order to facilitate the implementation of this six-point plan, a concerted and focused initiative must be mounted by the District's Office of Legislative and Governmental Affairs. This legislative and congressional initiative should focus on informing our lawmakers of the

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importance of these initiatives, what benefits can be derived from their implementation, and what funding shortfalls may exist where they can provide assistance.

This initiative should also include significant participation by the Communications Office to organize a comprehensive community outreach program to explain the concepts and gain the support of interest groups, and local, state, and federal agencies. This should result in a consortium of private citizens, activist groups, governmental agencies, and stakeholders who can speak as one voice in support of these funding and implementation initiatives.

- Develop and implement a strategy for a comprehensive legislative and congressional outreach initiative for Lake Okeechobee
- Develop and implement a strategy for a comprehensive constituency outreach program

(A set of one-page descriptions of the priority projects is being produced and will be available upon request Call Ken Ammon at 6502 or John Mulliken at 6649.)